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## Optimizing a magnetic resonance care pathway: A strategy for radiography managers

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## ABSTRACT

**Purpose:** This study reports the optimization of a local MR care pathway. A search of the literature did not result in any studies regarding the optimization of MRI care pathways through a formal research process. Discussions with international MR radiographers indicated that such development is often carried out using informal methods that are highly dependent on local conditions, that are rarely reported in the public domain and the validities of which are therefore not open to scrutiny; in addition, care pathways need to be specific to local healthcare needs and culture. In this study, the authors propose a formal documented methodology for developing a local MRI care pathway based on the well-established nominal group technique.

**Methods and materials:** A nominal group technique was conducted amongst a multi-professional panel. **Results:** 14 participants accepted the invitation to participate: an executive from the principal public general hospital, a manager from the national Ministry for Health, a service development manager from the allied healthcare professional sector, 2 senior physiotherapists, 3 nursing officers, 3 MRI radiographers, 2 medical physicists, 1 radiologist. Ten optimization related issues were identified and ranked in order of decreasing importance. Highest ranking scores were assigned to patient safety, education of referrers and use of quality criteria. The NGT method also brought forward novel themes in particular the need for a radiographer's technical report and the need for referrers to indicate pain levels of patients. **Conclusion:** The design of an MR care pathway was successfully optimized using a collaborative multi-stakeholder approach.

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## Introduction

At the MRI unit level, service quality is contingent on the design of the care pathway through which the MRI service is delivered and experienced by patients.<sup>1,2</sup> Hence, an optimized care pathway design is crucial for the attainment of an effective, safe and efficient service.<sup>3</sup> This study reports the optimization of such a local care pathway as initially perceived and developed by the researchers and based on input from local and international colleagues.

A search of the literature did not result in any studies regarding the optimization of MRI care pathways through a formal research process. Discussions with international MR radiographers indicated that such development is often carried out using informal methods that are highly dependent on local conditions, that are rarely reported in the public domain and the validities of which are therefore not open to scrutiny; in addition, care pathways need to be specific to local healthcare needs and culture. In this study, the authors propose a formal documented methodology for developing a local MRI care pathway based on the well-established nominal group technique (NGT). The study forms part of a wider study on continuous professional development for senior radiographers in Malta; the optimized pathway will provide input to curriculum development.

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The European Pathway Association (<http://www.e-p-a.org>) defines a care pathway as: “A complex intervention for the mutual decision making and organization of predictable care for a well-defined group of patients during a well-defined period. Defining characteristics of pathways include: an explicit statement of the goals and key elements of care based on evidence, best practice and patient expectations; the facilitations of the communication and coordination of roles, and sequencing the activities of the multidisciplinary care team, patients and their relatives; the documentation, monitoring, and evaluation of variances and outcomes; and the identification of relevant resources”. This study focuses on the “the facilitations of the communication and coordination of roles, and sequencing the activities of the multidisciplinary care team”. The design of clinical care pathways combines a variety of methods from the quality improvement and operational research literature. Such literature indicates that a critical characteristic to consider with respect to the sequencing of activities of the multidisciplinary care team is the coordination model required. Vanhaecht et al.<sup>4</sup> describe three different coordination models: chain, hub and web models. Chain models are used for relatively highly predictable care processes with a high level of agreement between the team members. Hub models are used for less predictable processes; in this model key persons will lead the organization of the care process and chain models are used for the more predictable sub-

processes. Web models are used for highly unpredictable, complex processes.<sup>4</sup> Diagnostic radiology would fit the hub model whilst the MRI care pathway sub-process fits a chain model which permits elements of flexibility as where practice involves a mix of routine and non-routine tasks (as in an MRI setting), employees need to be able to take initiatives in response to incidental findings or to optimize processes beyond the confines of standard operating procedures.<sup>5</sup>

## Method

Various techniques for the development of the care pathway were considered. A survey of the literature revealed that multi-stakeholder processes require consensus techniques such as the Delphi, nominal group or focus group techniques.<sup>6–8</sup> Four important practical issues were taken into consideration before deciding on the most appropriate technique to use: the approach needed to involve as many of the MRI stakeholders as possible, it needed to be based on a consensus building approach, it needed to ensure that all participants could voice their opinions freely, and finally be efficient in terms of time. These are the defining characteristics and strengths of the NGT technique. NGT methods gather a number of specifically invited experts, commonly 10–15, for a structured meeting on a specific subject.<sup>9</sup> The purpose of the NGT technique is to generate ideas, which are then discussed and ranked by the group.<sup>10</sup> The group is highly controlled, with discussion occurring only in the later stages of the process. A facilitator guides and controls the meeting by collecting ideas from participants, as opposed to leading the discussion.<sup>11</sup> The work of the facilitator is usually complemented by one or two other individuals acting as note-takers and co-ordinators of activities. The technique aims to avoid the known pitfalls of group interviews where some participants can be silent or feel intimidated in the presence of more articulate and dominant personalities. In NGT all members have an equal opportunity to contribute.<sup>11</sup> The nominal group technique as described by Wainwright et al.<sup>12</sup> was adopted for this study. To kick-start the process an initial model of the MR care pathway for adults was developed by the researchers with the help of a small multidisciplinary group consisting of an MRI radiographer, radiologist and medical physicist and forwarded to the invited participants. This ensured that the participants focus on the actual pathway during the NGT process proper. The NGT method used in this study is summarized in Table 1. The process in this study took approximately 2 h and generated quantitative rankings of key optimization related issues.

17 participants, representing radiologists, radiographers, management, medical physicists, policy makers, physiotherapists and nurses working in orthopaedics, neurosurgery and neurology were selected. The intention was to create a balanced representation of expertise from various sectors of professionals working in collaboration. Ideally the group of participants should also have included patient representatives. Unfortunately patient associations are still very much in their infancy in Malta, hence nurses who have themselves been MRI patients or had close family members referred for MRI were chosen to act as patient advocates. This had the added advantage that bias resulting from power inequalities between patients and healthcare professionals was avoided.<sup>14</sup> Since conduction of the NGT session in a clinical setting may influence participant responses, the session was carried out at a leading hotel. The process was recorded and transcribed verbatim to ensure that no data were lost and to provide a documented record of the proceedings. Ethical approval was received from the ethics committee of the University of Malta. All participants were provided with information regarding the study and consent was obtained before the start of the NGT.

**Table 1**  
The NGT method used in the study.

Step	Comment
1. Introductory statement	The initial care pathway model was projected on a screen and participants requested to confirm or otherwise whether it was suitable to kickstart the process or whether a major modification was required. A set of guiding questions was also presented.
2. Initial generation of issues individually	Participants were asked to silently list issues on the paper provided.
3. Round-robin listing of ideas	The participants were asked to articulate briefly each issue until all issues were exhausted. Issues were recorded on a flip-chart.
4. Clarification of issues	The group was then asked to consider each item on the list to ensure common understanding. No items were omitted or merged so that all ideas were given their due importance. <sup>13</sup>
5. Generation of individual top 10 lists	The participants were asked to individually select and prioritize the 10 issues that they felt were most important and record them on a worksheet.
6. Rating of issues according to relative importance	The worksheets were collected, and the issues and rankings noted.
7. Time out and icebreaker	The rankings for each individual issue were summed to give a total score.
8. Group discuss of most important issues	The top 15 issues were presented to the group for discussion with the facilitator only intervening to ensure focus. These were condensed to 10 issues.
9. Final ranking of issues	Participants were asked to individually rank the 10 issues in order of importance. This time the participants assigned a weighting to each item, with the most important issue receiving a weighting of 100 and the least important a weighting of 1. The eight remaining issues were given a weighting between 1 and 100.
10. Conclusion	The final list of 10 ranked issues was presented for final discussion. Participants were thanked for their participation and subsequently informed of the findings.

**Table 2**

Final ranking of the ten most important care pathway optimization related issues as determined by the participants.

Rank	Items	Remarks	Ranking score
1	Safety check at referral stage.	This will ensure that any contraindications related to metallic implants are resolved at an early stage hence eliminating delays on the day of the exam proper. <sup>15</sup> Psychological issues that may affect the procedure are brought to the attention of the MRI radiography team in advance. <sup>16,17</sup> This would permit specific anxiety reduction protocols to be employed.	80
2	Education of referrers	MRI education of referring clinicians is necessary to avoid inappropriate requests and efficient use of MR facilities. <sup>18,19</sup>	78
3	Establish pre-determined objective quality criteria for evaluation and monitoring at critical stages of the care pathway	Clinical criteria are a standard process adopted by all health care organizations that espouse the principles of continuous quality improvement. <sup>20–22</sup>	77
4	Define in terms of effectiveness, safety and efficiency the meaning of 'quality' for each sub-process of the care pathway.	This would ensure that patients receive effective care, in good time and at fair cost. <sup>23</sup> This should really be a precursor to issue 3.	76
5	Early explanation of the procedure to the patient before coming to MRI	An early explanation of the procedure to alleviate anxiety, and identify in advance those patients with claustrophobia is very important. <sup>24,25</sup>	69
6	Establish local referral guidelines (appropriateness criteria)	Referral guidelines to assist the referring clinician in choosing the best imaging modality. This issue is a precursor to issue 2. <sup>19,26,27</sup>	66
7	Transparent prioritization guidelines	Transparent prioritization guidelines to ensure urgent cases are scheduled earlier and non-urgent cases are prioritized fairly and in a transparent manner. System must be transparent so that clinicians will not hinder its implementation and so that patients feel that they have been respected. <sup>28</sup>	65
8	Knowledge of the care pathway by all stakeholders	This would ensure that the care pathway is accepted by all stakeholders and that any subsequent modifications are well understood and accepted by the various stakeholders. <sup>29</sup>	55
9	Patient satisfaction surveys	Patient satisfaction surveys are today considered as an indispensable tool to provide client feedback for further improvement of service quality. <sup>30,31</sup>	50
10	Urgency criteria for diagnostic results following the scan (flagging)	In particular critical incidental findings need to be brought to attention of referring clinicians immediately. <sup>32,33</sup>	37

## Results

14 participants accepted the invitation to participate: an executive from the principal public general hospital, a manager from the national Ministry for Health, a service development manager from the allied healthcare professional sector, 2 senior physiotherapists, 3 nursing officers, 3 MRI radiographers, 2 medical physicists, 1 radiologist. The final ten optimization related issues in order of decreasing importance as determined by the ranking scores assigned by the participants are shown in Table 2.

The group gave a strong affirmative answer when asked if the model as presented by the researchers with the additional 10 issues identified through the NGT was sufficient to form the basis of the desired future MR care pathway. The resulting MR care pathway is shown in Fig. 1. The pathway shows the patient's journey from when he/she is referred for an MRI scan up to the follow-up visit to the referrer. The numbers in brackets (1–10) in the diagram refer to the NGT identified issues from Table 2 relevant to that particular section of the pathway. The pathway is divided into various sub-processes at which defined quality outcomes (indicated with an 'O' in the diagram) and associated criteria would need to be inserted.

The following additional suggestions gleaned from the verbatim transcript of the session and which would add further support for the main issues of Table 2 were also incorporated into the care pathway (indicated as (a)–(e) in the diagram):

- Need for a mechanism to audit the appropriateness of referrals. *"We need to answer the question: has the investigation had an effect on patient management? We are all aware of the high percentage of patients being referred simply because the referrer has no other option – patients insist on an MRI even on occasions when the referrer thinks it is inappropriate"*
- Need to educate radiographers on procedures to follow following incidental findings: *"although there is an electronic*

*feedback mechanism linking radiographers and radiologists this is not always being utilized owing to the large throughput"*

- Importance of the introduction of a radiographers' technical report: *"Radiographers should issue a written technical report in which they confirm that the quality of the images was sufficient for diagnosis, and that safety criteria have been met and to record any variance from the original care plan. This technical report would form the basis for audits..."*
- The use of social electronic media: *"We should use social electronic media for providing early explanation to patients on what to expect during an MRI scan using social electronic media"*
- The importance that the referrer qualifies pain levels of patients: *"The referrer should qualify the region and level of pain that the patient may be experiencing. This information would be useful for radiographers to plan the procedure so that the most important sequences are acquired first in relation to the clinical question"*

## Discussion

The MR care pathway describes the tasks performed by the various members of the healthcare team and their interactions with each other and the patient. The aim is to achieve the desired defined quality outcomes at the various sections of the pathway. The group highlighted 10 issues that should be integrated into the initially proposed care pathway. These are listed in order of decreasing importance in Table 2. The 'remarks' column in the same table provides further explanation and discussion relative to the literature. It is welcoming to note the importance given by the participants to patient safety, education of referrers and use of quality criteria. The group has identified the importance of involving the referrers at an early stage, insisting that the latter are knowledgeable about the care pathway, and that they have access

## MR Care Pathway

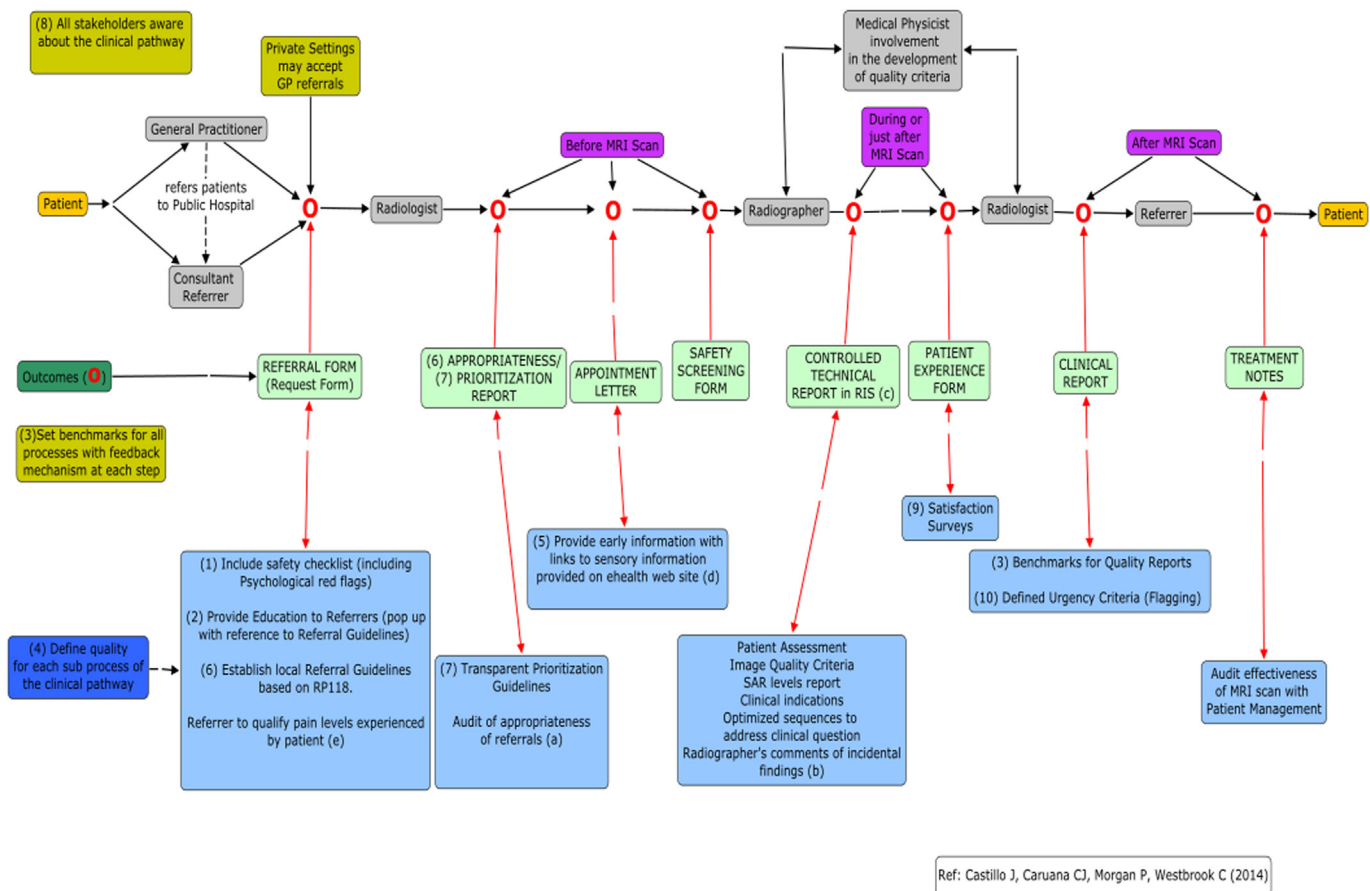


Figure 1. Final MRI care pathway.

to transparent prioritization guidelines. This would reduce individual barriers to the implementation of the pathway.<sup>29</sup>

Two important issues are the importance of referral and quality criteria. The Institute of Medicine round table on quality of care referred to underuse, overuse and misuse of care as safety threats to patients at both the individual and collective level.<sup>34</sup> Only when compilation, disclosure and evaluation of safety and quality indicators with respect to previously established quality criteria, will the quality of clinical practices be improved.<sup>35</sup> In addition, evaluation should focus not only on end clinical outcomes but also on intermediate sub-processes<sup>36,37</sup> as proposed in this study. It is envisaged that audit tools in the form of checklists will be developed to evaluate key intermediate sub-process outcomes (marked with an 'O' in the diagram) that have major impact on end patient outcomes.<sup>38</sup>

The NGT raised issues that were novel. Most importantly for the radiography profession, the group suggested the introduction of a technical report by radiographers that together with the radiologist diagnostic report would provide a more complete documentation to the referrer and to management. This would certainly facilitate the successful implementation of the pathway.<sup>39,40</sup>

Another novel theme raised by the patient advocates was the importance of referrers indicating the level of pain experienced by patients. This would permit radiographers to plan a safer and more comfortable procedure for patients. This important suggestion highlights the capacity of healthcare professionals to act on behalf

of patients, and the strength of the NGT method in bringing forth previously unknown issues.

Prior information on the MRI procedure for patients should make better use of interactive information technology. Information about what patients should expect during an MRI procedure would be an effective way of improving the workflow and quality of the service. Although such information is not as widely available as is desirable, social media are already being used by patients to liaise with medical practitioners and acquire timely information.<sup>41</sup> In addition, web based clinical decision support systems could assist referring clinicians with respect to referral criteria.<sup>27,42</sup>

The production of a prioritized list of issues may be seen as a limitation given that the method involved focusing only on the top 10 issues and setting aside those of lower priority. However, this limitation was addressed by asking all participants to silently generate their own list of issues and thus ensure that all issues have an equal probability of being placed on the discussion agenda. This procedure avoided significant risk of loss of important data when more assertive members of the group dominate effectively excluding the views of others. One can expect a high level of confidence that the group listed the most important items that should be integrated in the pathway. In addition, the process of selection and prioritization ensured that the issues which were most important to the participants received the highest level of attention. Without this mechanism, there would have been the risk that the discussion be dominated by one or two contentious issues.



## Conclusion

This study started from a model of the MR pathway as perceived by the researchers. The pathway was then optimized through a nominal group technique. Care pathways are widely believed to be an important tool for ensuring the delivery of high quality, evidence-based care. This paper has presented one example where stakeholders with an interest in MRI and service development have come together to optimize an MRI care pathway collaboratively. The findings indicate that participants attached the highest importance (rank score >70) to safety, referrer education and defining quality criteria. The NGT method also brought forward novel themes in particular the need for a radiographer's technical report and the need for referrers to indicate pain levels of patients. MRI radiographers in Malta now would need to acquire the additional knowledge, skills and competences required to deliver the care pathway through a CPD programme with curriculum content partly based on the care pathway identified in this study. The pathway is considered as a living document, once the MRI radiographers are adequately prepared through CPD it will be implemented, evaluated and if necessary revised in an iterative process.

## Conflict of interest statement

None.

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